



# **Geothermal Power**

**Presented to**

## **Imperial Valley Study Group**

**San Diego, California  
February 10, 2005**

# MidAmerican Energy Holdings Company

## Ø Six Primary Business Platforms:

### Ø **MidAmerican Energy**

- Ø Distributes electricity and natural gas to 1.3 million customers in Iowa, Illinois, South Dakota and Nebraska.

### Ø **CE Electric UK**

- Ø Distributes electricity to more than 3.6 million customers in the Northeast of England and across Britain.

### Ø **CalEnergy**

- Ø Owns and operates power plants in Illinois, Arizona, California, New York, Texas and the Philippines.

### Ø **Kern River Gas Transmission Company**

- Ø Owns and operates a 1,643-mile gas pipeline from southwestern Wyoming to near Bakersfield, California.

### Ø **Northern Natural Gas**

- Ø Owns and operates 16,600 miles of pipeline from Texas to the upper Midwest.

### Ø **HomeServices**

- Ø Second-largest residential real estate brokerage company in the United States, based on closed transactions.

# MidAmerican Energy Holdings Company

- Ø Executive offices - Omaha, Nebraska
- Ø Corporate headquarters - Des Moines, Iowa
- Ø Privately owned by a four-party investor group - Berkshire Hathaway is the largest shareholder
- Ø Business in U.S., U.K., Philippines, Poland and Australia
- Ø 5 million electric & gas customers
- Ø \$6.7 billion annual revenue
- Ø \$20 billion in assets
- Ø Approximately 11,500 employees
- Ø Approximately 9,000 MW of net generation capacity
- Ø [www.midamerican.com](http://www.midamerican.com)

# CalEnergy Geothermal Development History in Imperial Valley

Ø Fuel Source: Geothermal

Ø Location: Calipatria, California

Ø Salton Sea I: 1982 10 MW

Ø Vulcan: 1986 38 MW

Ø Elmore: 1989 42 MW

Ø Hoch: 1989 42 MW

Ø Salton Sea III: 1989 50 MW

Ø Leathers: 1990 42 MW

Ø Salton Sea II: 1990 17 MW

Ø Salton Sea IV: 1996 40 MW

Ø CE Turbo: 2000 10 MW

Ø Salton Sea V: 2000 49 MW

Ø Total Capacity: ~ 340 MW



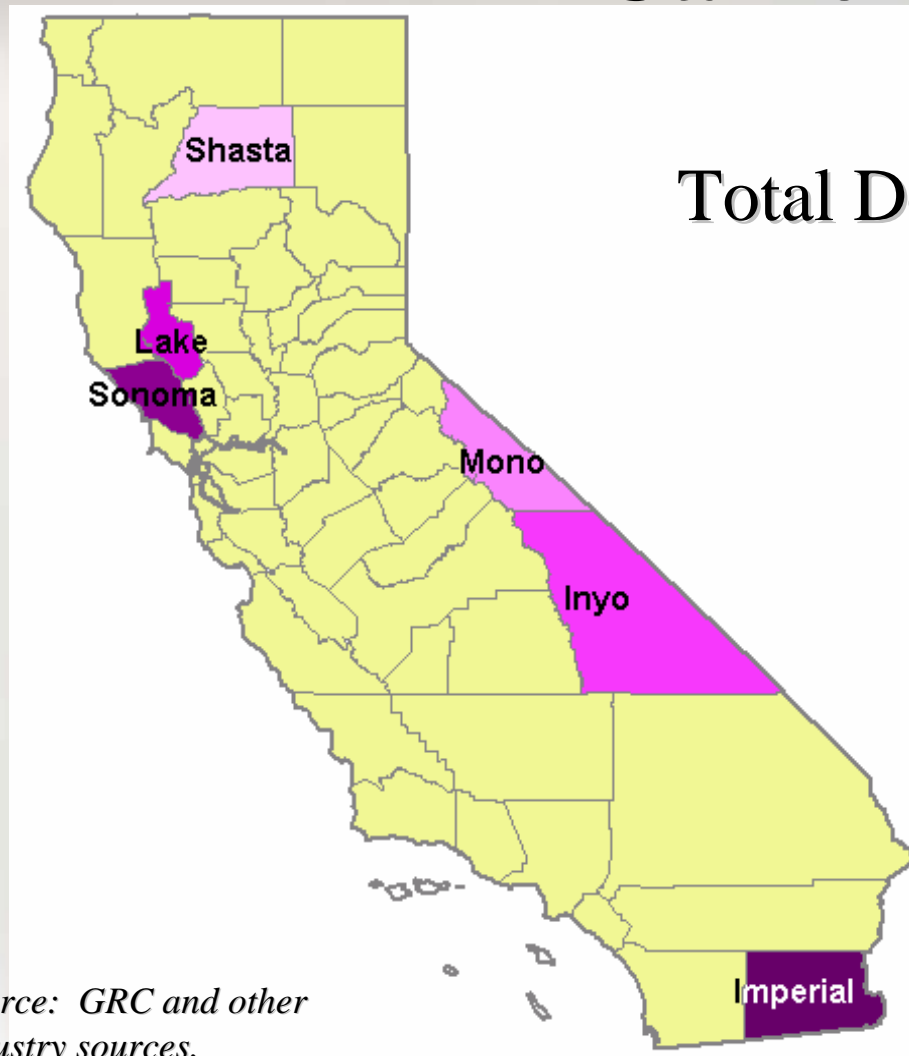
# Salton Sea Unit 6: Proposed Geothermal Plant



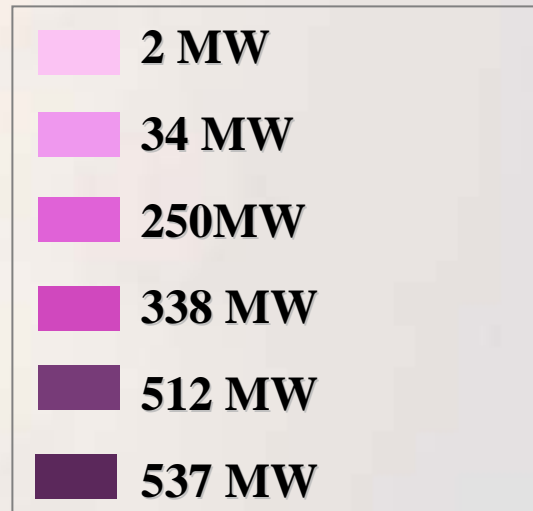
- Ø Capitalizes on a vast regional potential
- Ø Fuel Source: Geothermal
- Ø Location: Imperial County, California
- Ø 205 MW net output
- Ø Planned COD 2008
- Ø Base-load plant
- Ø High availability factor
- Ø “Green” energy
- Ø Proven technology
- Ø In-state Renewable Energy



# Developed Geothermal Power In California



Total Developed: 1,673 MW



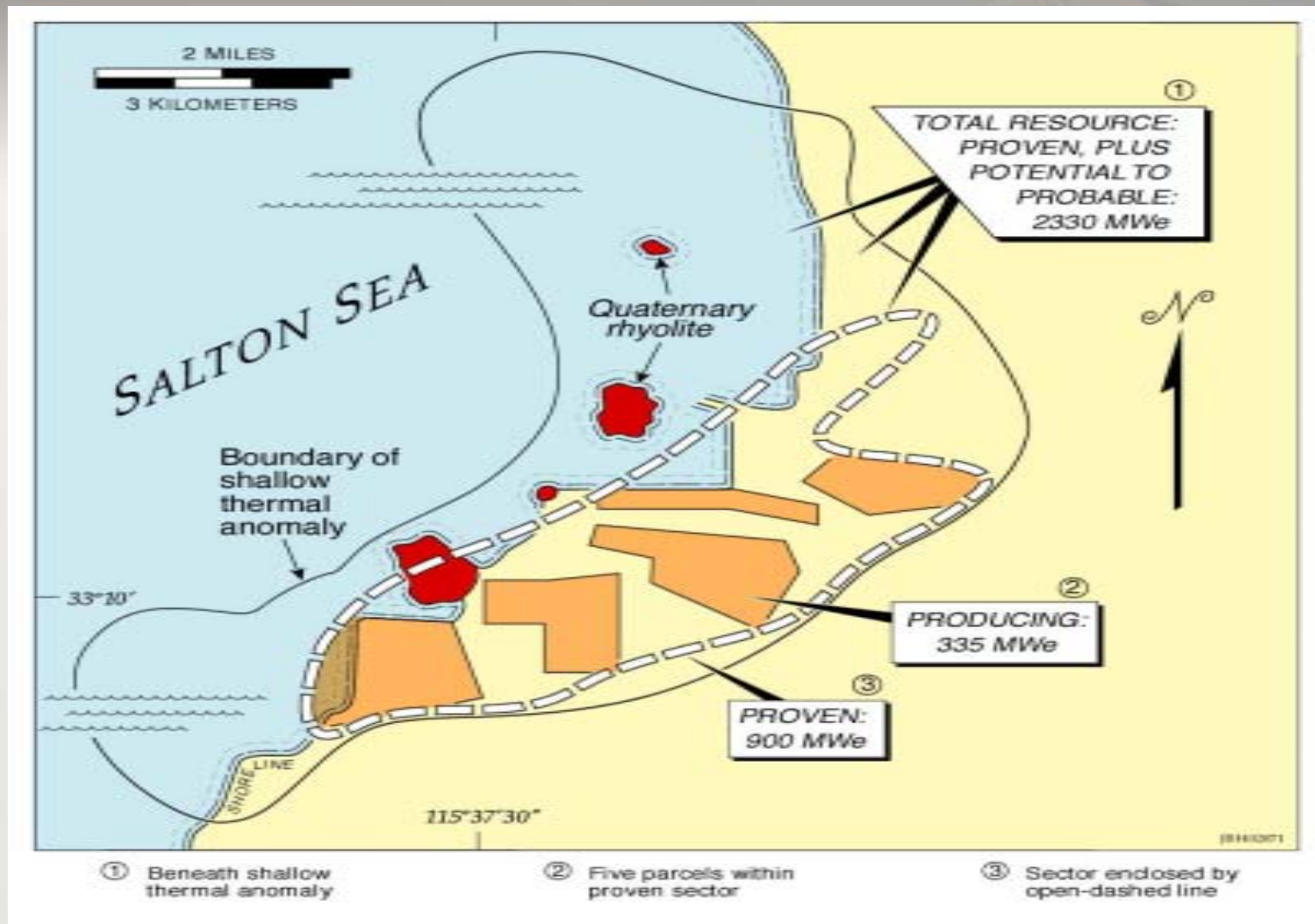
Source: GRC and other industry sources.

# New Geothermal Development Opportunities in California

Area	<u>Total Capacity</u>		Capacity In Use (Gross MW)	<u>Incremental Capacity</u>		Most-likely Incremental As % of State Total
	Minimum (Gross MW)	Most-Likely (Gross MW)		Minimum (Gross MW)	Most-likely (Gross MW)	
<b>California</b>						
Imperial Valley	1,900	2,500	550	1,350	1,950	65%
The Geysers	1,200	1,400	850	350	550	18%
Medicine Lake	150	200	0	150	200	7%
Other	<u>450</u>	<u>600</u>	<u>300</u>	<u>150</u>	<u>300</u>	<u>10%</u>
<b>California Total</b>	<b><u>3,700</u></b>	<b><u>4,700</u></b>	<b><u>1,700</u></b>	<b><u>2,000</u></b>	<b><u>3,000</u></b>	<b><u>100%</u></b>

Source: GeothermEx, Inc. 2004

# Salton Sea Resource Area, Imperial Valley, CA



Source: GRC



# Geothermal Characteristics

- **Baseload Operations**
- **High Capital Costs**
  - Essential to have long-term (30-years) contract
- **High Capacity Factor**
  - Greater than 90% annual availability
- **Cleaner Energy<sup>1</sup>:**
  - Virtually no Sulfur and Nitrogen Oxides emissions (SO<sub>x</sub> and NO<sub>x</sub>)
  - 92-percent reduction of water consumption,
  - 87-percent reduction of volatile compounds (VOC)
  - 61-percent reduction of particulate matters (PM10)
  - 78-percent reduction of carbon dioxide (CO<sub>2</sub>).

<sup>1</sup> When compared to a combined cycle plant of similar capacity

Source: SS6 Application for Certification

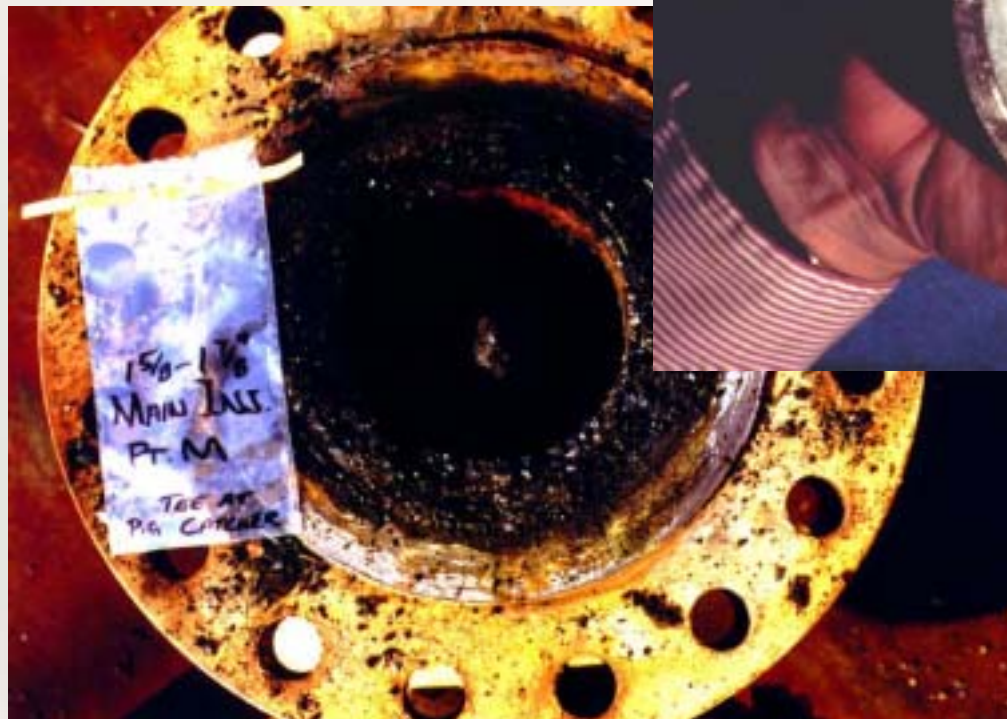
# Drivers of Renewable Markets in WECC

- California 20% RPS for Investor-Owned Utilities
- Voluntary RPS by LADWP, IID, SMUD, Riverside and other SCPPA members
- Nevada 15% RPS for Investor-Owned Utilities
- PacifiCorp RFP for 1,100 MW of renewable energy by 2010
- Western Renewable Energy Generation Information System (WREGIS)
  - Will track renewable energy in WECC
  - Online 2005
  - Sponsored by California Energy Commission and Western Governors' Association

# Geothermal Development

- **New geothermal development schedule**
  - Construct 3 new 200 MW plants, one every 2 years starting in 2009 (*all 600 MW could be developed by 2010 under expedited conditions*)
  - Develop remaining 1,100 to 1,200 MW of geothermal power beyond 2013
  - 18 months to permit a new geothermal plant
  - 26 months for construction
- **Requirements to begin construction of new geothermal plants**
  - Long-term Power Sales Agreement– 30 years
    - Geothermal plants are base load – cannot cycle the plant up and down
  - CEC Certification and other permits in place
  - Water supply and Interconnection Agreements
  - Engineering, Procurement and Construction Contract
  - Suitable Financing
  - Long-term transmission service agreement to customer

Salton Sea Field  
Imperial Valley, CA



Severe Scaling from  
Hot Geothermal Brine  
Flow Through Pipelines



SINCLAIR NO. 1  
TEST FACILITY

ABANDONED AFTER  
TWO MONTHS DUE TO  
MINERAL DEPOSITION







Severe Corrosion from Hot Geothermal Brine Flow Through Carbon Steel Pipe

# SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE







**GEOHERMAL DEVELOPMENT  
CO-EXISTS WITH  
WILDLIFE**

**GEOHERMAL DEVELOPMENT  
ALSO CO-EXISTS  
WITH AGRICULTURE**





THE SALTON SEA NEAR UNITS 3 & 4



# CalEnergy's Region 1, Salton Sea Field





Contact:

Greg Merrigan

(515) 252-6922

(515) 979-1280 (cell)

[gdmerrian@midamerican.com](mailto:gdmerrian@midamerican.com)